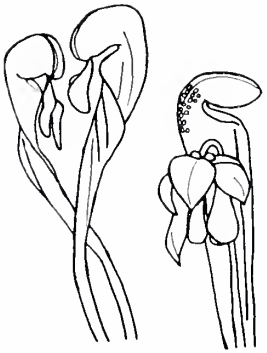
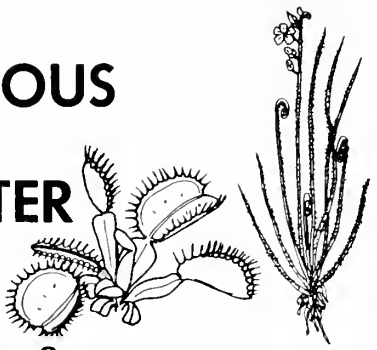
XC
.A704
V.9
#2

CARNIVOROUS PLANT NEWSLETTER

VOLUME 9, Number 2 JUNE 1980



CARNIVOROUS PLANT NEWSLETTER



Volume 9, Number 2
June, 1980

Cover

Sarracenia flava L. Variant with red-veined green lid, and deep red tube exterior. Brunswick Co., NC. See feature article, pages 41-44, for details.

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your subscription to CPN:

All correspondence regarding subscriptions, address changes and missing issues should be sent to Mrs. Kathy Fine, c/o The Fullerton Arboretum, California State University, Fullerton, CA 92634. DO NOT SEND TO THE CO-EDITORS. Checks for subscriptions and reprints should be made payable to CSUF FOUNDATION-ARBORETUM.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

Copy deadline for the Spetember issue is August 1, 1980.

CO-EDITORS:
D. E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677
J. A. Mazrimas, 329 Helen Way, Livermore, CA 94550
T. L. Mellichamp, Dept. of Biology, UNCC, Charlotte, NC 28223
Leo Song, Dept. of Biology, California State University, Fullerton, CA 92634

SECRETARY-TREASURER: Mrs. Kathy Fine, c/o The Fullerton Arboretum

PUBLISHER: The International Carnivorous Plant Society by The Fullerton Arboretum, California State University, Fullerton, CA 92634. Published quarterly with one volume annually. Printer: Kandid Litho, 129 Agostino Rd., San Gabriel, CA 91776. Circulation: 820 (203 new, 617 renewal). Subscriptions: $7.00 annually, $9.00 foreign. Reprints available by volume only.

© 1980 Carnivorous Plant Newsletter. All rights reserved.

Editor's Corner

WE ALMOST KISSED SARRACENIA OREOPHILA GOODBYE!

It was an excellent idea for Congress to pass the Endangered Species Act of 1973 which made it possible to prevent the extinction of many plants and animals. Thanks also goes to the Smithsonian Institution for identifying some 3,000 species of plants considered to be in danger of extinction. From this list about 1700 species needed immediate protection if they were to survive in their natural habitats. *Sarracenia oreophila* was one of these plants.

So far only *56* plant species passed the long legal process and studies needed to protect the plants under the Endangered Species Act. Now with several recent developments, I wonder if any more can be saved.

The problem now is that Congress amended the 1973 law in direct response to the snail darter problem (a little fish that was delaying the construction of a Tennessee dam). This incident created such a furor in Congress that they now require not only the *biological* evaluation but also several kinds of *socioeconomic* studies as part of the legal package to protect a plant. In addition, they added a time limit of *two* years to complete all studies or else the plant cannot be considered as endangered unless new information is presented.

These recent changes now have increased expenses and effort for the protection of each plant species to the point where they are so excessive that it may be beyond the current abilities of the limited staff and budget of the Endangered Species Office to complete all the paperwork.

What can you do? Write to your Senator or Representative and let them know how you feel about protecting *S. oreophila* and the 7 other Carnivorous Plant species on the Endangered List.

REF: AMER. HORT. 52(2):3 (1980)

(Late note: We have been informed that *S. oreophila* made the Endangered List before the new guidelines became effective.)

News and Views

CRAIG J. BOLTON (P.O. Box 501, University of Dallas Station, Irving, Texas, 75061) asks: If you know of collectors, local societies or nurseries specializing in carnivorous plants in the Dallas—Ft. Worth area I would appreciate hearing from you.

JOHN B. BURNS (6304-H South Padre Island Drive, Corpus Christi, Texas, 78412) writes: Found a use for the 2-liter plastic soft drink bottles that have the black or green bottoms. (Coca-Cola, Tab, etc.) See fig 1.

First, pull off the black or green bottom of the bottle. This is usually fairly easy. You now have a plastic pot and a dome bottomed bottle. See fig 2.

With heavy scissors cut off the top of the bottle about one inch above the point where it starts to taper toward the neck. See fig. 3. If you cut below the taper the plastic dome will be the same size as the pot and will not fit.

Check by fitting dome into pot. The dome should go in only as far as needed in order to be stable. If the dome goes in too far trim off the excess.

The adhesive under the label can be removed with *'Varsol'* or charcoal starter fluid. Removing as much paper as possible

fig. 1

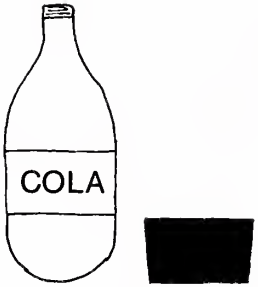


fig. 2

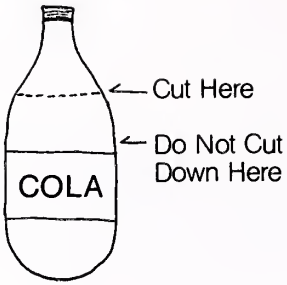


fig. 3

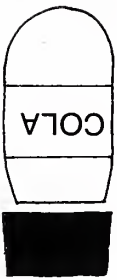


fig. 4

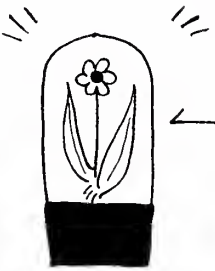


fig. 5

before taking off adhesive makes it easier. Use the '*Varsol*' or charcoal starter fluid to remove the dots of adhesive on the top of the dome. (Be careful not to set yourself or anything on fire) A little work may be needed in removing the adhesive. **Be careful not to scratch the dome.** Wash well with detergent and its ready for planting.

BILL CARROLL (N.C. Botanical Garden, Chapel Hill, NC 27514) says: I enclosed three slides showing CP that I've propagated by tissue culture methods.

Its interesting that these plants survive without insects. The flytrap (Dionaea) is a year old and has never seen a fly!

When transplanting to a soil mixture (two parts peat moss and one part fine vermiculite), I water the plants with Miracid® or Rapidgro®, ¼ teaspoon per liter of water. Rapidgro® boosts the growth of flytrap and butterwort seedlings as well. I've applied it directly onto the plants about every sixty days with no ill effects.

For the tissue culture formula, I used Miracid® in place of a lengthy list of chemicals and added sucrose and agar and Dionaea grows very well on this medium!

One year old flytrap grown on nutrient agar. Photo by Bill Carroll.

Fig. 2. *P. pumila* growing from tissue culture at the N.C. Botanical Garden.

Fig. 3. P. lutea about to flower in tube at the NCBG.

Photos by Bill Carroll

REINHARD FRENZER (Johann Strauss-Gasse 24, A-2340 Modling, Austria) states:

For more than 2½ years I've subscribed to the Carnivorous Plant Newsletter and I want to thank you for your efforts as a co-editor to make the CPN as great as it is.

Especially the colour-pictures are great. Sometimes they are of great help to grow a plant, as you can get some ideas about the natural habitat of a plant. If it is possible, please give the CP-growers the opportunity to see more CP's in their habitat.

In Austria there are only few CP's native. They are *D. anglica, D. intermedia, D. rotundifolia, P. vulgaris, P. alpina, P. leptoceras, U. vulgaris,* maybe some more *Utrics* and also *Aldrovanda*, but although you can find locations of these latter in the literature, I do not know of someone, who did find these during the last 10 years or so, maybe they are extinct now. Enclosed you find two photos of *D. anglica* and *D. rotundifolia* in their natural habitat in the so-called "Ibmer Moor" (Ibm is a small village, Moor means bog), 30 km north of the town Salzburg in Austria. Both species are growing together and you can also find the hybrid between both, *D. x obvata*.

Enclosed you'll find the bag of a sort of candy you can buy here in Austria even in supermarkets and which is containing an extract of *Drosera*. (German: Sonnentau, English: Sundew). I do not think that the extract is obtained from the native Droseras. (Please turn page to see copy of top of package.)

Herbalpina

Alpenkräuter-Zuckerl

Zusammensetzung:
Zucker, Stärkesirup, Malzextrakt,
Menthol und den Extrakt aus:
Sonnentau, Eibisch, Süßholz, Hollunder.
Spitzwegerich, Quendel, Stiefmütterchen,
Thymian.
Inhalt: 70 Gramm
Wander Ges.m.b.H., Wien

ALAIN GODBOUT (38 Rue LaBelle, Beauport, Quebec, Province de Quebec, Canada, G1E 5R3) writes: Have you ever written on the genus *Parnassia?* It appears that between *Drosera* and *Parnassia,* there exists analogies. Is *Parnassia* carnivorous? It seems that *yes*. If it is true, it would be a new system to capture insects because the system wouldn't be based on leaves but on flowers. The glands that bound sterile stamens (stamenods) appear to be carnivorous organs. They secrete a limpid, sticky, acid liquid. The insects are immediately limed and assimilated

This plant genus grows in calcareous, damp soils. About fifty species exist, among which twenty in China, six (?) in America.

In Quebec Province (Canada), we have *Parnassia kotzebuei* Cham., *P. palustris* L. var. *neogaea* Fern., *P. glauca* Raf. (Glaucous parnassia); syn. *P. caroliniana*, *P. parviflora* DC. Type: *Parnassia palustris* L.

References:

1. "Flore Laurentienne", Frere Marie-Victorin, Montreal University Press, Montreal, 1964, P. 291-92.

2. "Traite de Botanique Systematique, Par M. ChaDeFaud et L. Emberger". Tome II "Les Vegetaux Vasculaires", par L. Emberger, Fascicule II p. 1361, Masson et cie, France, 1960.

Mr. John H. Hummer (1705 N. Quebec St., Arlington, VA 22207) writes: I have the following useful notes and items to pass along.

For those looking for ways (natural) to insulate and acidify their CP (especially greenhouse growers of the north). Evergreen droppings will do the trick. I have already this fall spread down over 150 gals. of pineneedles in and outside my greenhouse (an ideal winter cover for an outdoor bog garden) and these pineneedles have been added even to the waters of my Utric's. Be sure if you take pine needles from an isolated group of Pine trees, you don't take all their mulch either. ALWAYS BE SELECTIVE! These pineneedles will break down rather rapidly so that by springtime, their nourishment will feed your Sphagnum and CP.

Utric's are a highly effective form of mosquito control! Especially those species which produce an abundance of bladders *(U. intermedia, U. macrorhiza* ssp. *vulgaris).* Inside my greenhouse, since the introduction of these plants, the mosquito population (from pans of water they breed in) has become nearly extinct. In all my water-holding containers in my greenhouse there now exist at least one or more forms of *Utricularia.* In dealing with the terresterial form of *U. subulata*, I have found that once it's infested a new 'likeable' area, it is next to impossible to ever eliminate.

The family of plant parasites *Pseudococcus* (Coccus), mealy bugs or plant lice, can really be a problem for growers of *Sarracenia*. I have known the problem well, and if left unchecked, the results will be an infestation of these pests at epidemic proportion, and much reduced crop of *Sarracenia*. Check inside the interior of older *Sarracenia* pitchers, where they conveniently nest. If you see more than one, chances are there's an infestation, since they're able to reproduce quickly. Check also at the base of leaf petioles where they meet the rhizome; another clever nesting and hiding spot for these pests. The most effective and safe treatment against these pest is the use of Isotox®. I am grateful to Dave Kutt for informing me on this highly effective insecticide. Isotox® is systemic and will rid your plants of these parasites once and for all. Give them a double treatment several days after you intially treat them. Be sure to treat the pitcher plants infested at their crowns. GOOD GROWING!

Variegated *N.* alata
Photo by I. Kusakabe

Isamu Kusakabe (5-14-6 Chitosedai, Setagaya, Tokyo, Japan 157)

I've enclosed a picture of *Nepenthes alata* 'variegata' which was discovered at a local nursery. This is a beautiful foliage plant but it's rather hard to bear pitchers. The leaves are highly variegated with white and green striations, but the one pitcher shown here does not seem to have this trait.

Jim Miller, (2319 Ninth St., Green Bay, WI 54304).

Due to the nation-wide gas crunch, I have not had as many opportunities to explore the Wisconsin and Michigan bogs as I might have wished. I did however, have the pleasure of visiting Cedarburg Bog at the invitation of Millicent Ficken, *Professor of Zoology* and Director of the University of Wisconsin Field Station there. The bog is a 2,000 acre preserve, over half of which is owned now by the state. It is located near Cedarburg and Saukville just north of Milwaukee, Wisconsin.

This late in the summer, the bugs were quite a nuisance. They nearly form clouds around your head as you enter the bog and pause only long enough to occasionally bite.

The carnivorous plants are found here in several locations but I had only time enough to visit one location which is a string bog deep in the preserve area. As might be expected, *Sarracenia purpurea* ssp *purpurea* was found here in incredible numbers, not only in the open spots but well into the surrounding woods as well. The soil here is mainly rich peat and decomposed matter so that walking is nearly impossible without sinking several feet into the ooze.

The main objective of my initial visit was locating *Drosera linearis* and I was rewarded by the sight of thousands of plants all through this location. While this species is apparently on the decline elsewhere, here it is quite prolific forming dense colonies. They are certainly on the increase here as nearly every plant was seen to have many maturing seed pods while others were still in flower. All the plants were found growing in the open spots in full sun. As expected, *Drosera rotundifolia* was found as well, but in this location they were found on slightly higher ground growing on sphagnum and

shaded over by the taller plants and shrubs. A large group of *D. rotundifolia* was also observed in fairly open woods growing on a rotten cedar stump.

Though I did a little searching, I could not locate *Drosera anglica* in this area. Other CPs in this bog were *Utricularia cornuta* and *U. vulgaris* was seen in a stream nearby.

ROBERT McMAHON (3518 Lincoln Way, Apt #1, Ames, Iowa 50010) is looking for other CP enthusiasts in the central Iowa region with whom to correspond. All you central Iowans write Robert at the above address and get aquainted.

Philip Sheridan (5729 S. 2nd St., Arlington, VA 22204) announces the demise of the Potomac Valley Carnivorous Plant Society and cessation of the bulletin. Interested members of the group in Philip's vicinity will continue to meet informally. If you have not yet received a refund possibly owed you from paid dues, please contact Philip at the above address. He requests you cancel payment on checks. Philip also requests those former members in the DC area to contact him so that work can be continued informally. He reports a bog recently found near Annapolis, MD which is in relatively good condition and contains *Drosera intermedia* and Utricularias. Philip is interested in preserving this area and would like potential helpers to contact him also.

STEVE SMITH (R.D. 1, Box 296, Kirkwood, N.Y. 13795)

On dormancy for the temperate species: For the past 3 years I remove the plants from the growing medium, then soak in full strength solution of Benomyl for a few minutes. Afterwards, I place the dormant roots (I cut off all old leaves except for the winter leaves) in a baggie with some living sphagnum moss for moisture. I put different plants in different bags and write species and date and then I store in my refrigerator until spring. To date, I have not lost a plant using this method. I have a "double batch" of plants which means I have duplicates that I grow a half year off the seasonal cycle. They are presently grown in an indoor terrarium under lights which allows me to show off my collection in any season.

For growers who have water with a pH near neutral, the pH can be lowered by using distilled white vinegar. This should be done carefully as a little goes a long way. An inexpensive low pH test kit can be purchased at a pet store. By using this method I noticed that it enhanced the red coloration of my plants. I also noticed that it slows down algae growth.

Finally, I think it is a good idea that when people exchange cuttings of *Nepenthes,* they should include a mature pitcher for the recipient to examine. It usually takes a long time before a cutting will yield large mature pitchers.

Parker Webb (302 Stayman Dr., Ranson, West Virginia 25438) asks: How soon do *D. intermedia* seedlings flower? The reason I'm asking is I have some *D. intermedia* seedlings that are 3 months old and they are flowering! Is that normal?

S. flava
Photo by Steve Smith

Review of Recent Literature

Adams, RM and Koenigsberg, SS, Lanhans RW, 1979. In vitro propagation of the butterwort *Pinguicula moranensis* H.B.K. HortScience 14: 701-702.

The authors describe an agar formula technique for successfully obtaining more rooted buds from leaves of the above species. The agar formula and methods are described in detail.

Adams, RM, and Langhans,RW.,cover by R. Scott Bennett, 1979. Carnivorous plants underexploited for indoor culture. HortScience 14: 678, 787, and color covers.

This article briefly describes CP useful for indoor culture, along with some general CP descriptions, functions and problems. There is a fine painting of five CP species in color on the cover. Reprints (the article on one side and the color painting reproduced double page on the other of heavy paper suitable for framing) are available at cost, $1.00 including postage, from: Dr. RW Langhans, Cornell Floriculture, 20 Plant Sciences Bldg., Ithaca, NY 14853.

Army Corps of Engineers, 1977, and 1979 (supplement). Wetland plants of the eastern United States. (Publication No. NADP 200-1-1 *with* supplement 1, US Army Corps of Engineers, North Atlantic Division, 90 Church St., New York City, 10007, both parts for $8.40, ppd.).

This interesting handbook was designed for ACE personnel to use in the field and is by the photo matching concept. Each wetland species for the area features a description and at least one, most often two, color photos. CP covered are *Drosera fififormis, D. intermedia, D. rotundifolia, Sarracenia purpurea* ssp. *purpurea,* and *Utricularia "cornuta"* (the photo actually shows *U. vulgaris!).* In addition to the CP, several hundred other wetland plants of interest are covered as well, including some native orchids. There will likely be further supplements. In spite of the *Utricularia* error identification, the set is well worth the low cost. Be certain to get both parts for the one price since the supplement is actually larger than the first portion, and contains the table of contents, index, corrections and bibliography. (DES)

Beaver, R.A., Biological studies of the fauna of pitchers plants *(Nepenthes)* in West Malaysia. Ann. Soc. Entomol. Fr. 15(1):3-18 1979.

The author describes 25 species of insects and 3 species of arachnids living in the pitchers of *N. albomarginata, N. ampullaria* and *N. gracilis* in Penang. The differences between the faunas of different *Nepenthes* species can be related to the habitats & pitcher structure. Most of the species have aquatic larvae that feed on nutrients in the pitcher liquor but one predator spider and one fly larvae actually catch insects entering or leaving the pitcher. Most of the insects (79%) breed only in the pitcher habitat and are termed nepenthebiont species.

Beaver, R. Description of the male and larvae of *Endonepenthia schuitemakeri,* new record, from *Nepenthes* pitchers. Ann Soc. Entomol. Fr. 15(1): 19-24. 1979.

A small two-winged fly of hunchback appearance (Diptera, Phoridae) was found living in *Nepenthes* pitchers in West Malaysia.

Dexhimer, J. Ultrastructural localization of enzymatic activities in the cells of the digestive glands of *Drosera capensis* during the mucigenic phase: Detection of glucos-6-phosphatase activity. Cytologia (Tokyo) 44(1): 153-160. 1979.

(Please turn to p. 38)

The author found that the majority of the enzyme activity was concentrated in the cell wall, in the zones where mucilage accumulate.

Grjebine, A. The mosquitoes living in the Malagasy pitcher plants: New species of the genus *Uranotaenia* (Diptera, Culicidae). Ann. Soc. Entomol. Fr. 15(1): 53-74. 1979.

Four new species of mosquito are described which exhibit faunistic differences depending if they live in the ground pitchers or the trumpet-like pitchers of taller plants. The mandibles of two of them are highly adapted to predation.

Kurahashi, H., Beaver, R. *Nepenthomyia malayana*, a new genus and species of calliphorid fly bred from the pitchers of *Nepenthes ampullaria* in West Malaysia. Ann Soc. Entomol. Fr. 15(1): 25-30. 1979.

The authors describe a large blow-fly of a new genus living in *Nepenthes* pitchers.

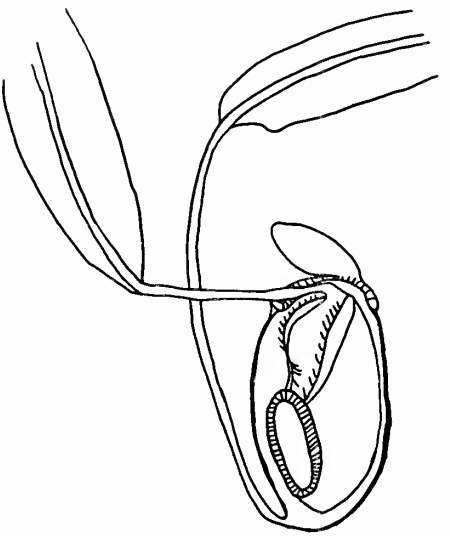
(Please turn to p. 49)

Carnivorous Plants Do Not Appear To Be Cannibals

by D.C. Speirs (Box 6830, Stn. D, Calgary, Alberta T2P 2E7, Canada)

In an 1879 issue of Gardener's Chronicle (Vol. 12, page 565) is an interesting note on *Nepenthes*. A plant was illustrated showing a young pitcher that pushed into an older pitcher and developed inside it. The interior pitcher was quite healthy and green, and it did not appear to be affected by the digestive juices of its host. For those of you who grow *Nepenthes*, this might make an interesting study, deliberately pushing young pitchers into older ones and seeing what happens. This could be done in two ways. Firstly, both pitchers might be from the same plant. secondly, each pitcher could be from a different plant or clone, to see if the host will attack the foreign pitcher.

In the century since this note was published, it appears that this unusual occurance has not been repeated. Because 1879 issues of Gardener's Chronicle are difficult to come by, the original sketch has been redrawn and is presented here, showing a cut-away view of the host pitcher with its companion inside.



DARLINGTONIA

by Jim Miller (2319 Ninth St., Green Bay, WI 54304)

Many people, myself included, have expressed frustration at the difficulties of growing *Darlingtonia*. Having grown these plants in Tallahassee where daytime temps may reach over a hundred degrees, I am quite familiar with the methods neccessary to keeping them healthy.

First, the best way to grow this plant in warm climates is to keep it in a fairly shady location. That means no direct sunlight during the hottest summer months. I have grown them indoors beside an east facing window (getting only an hour of early morning sun) as well as in my greenhouse under the lowest bench. Indoors, the plant should be misted twice a day with refrigerated distilled water and watered with the same only when the growing medium begins to feel dry. At least twice a month the plant should be taken outdoors and dunked in a pail of cold, pure water. This flushes the root system and washes out any accumulated salts. The dunking should be done three or four times by submerging the plant, pulling it out of the water and allowing the water to drain through the pot before repeating the process. This procedure should also be used each week or so on plants grown outdoors. The healthiest growth seems to come when the plants are grown in live sphagnum as this seems to keep roots cooler. The outdoor plants may be grown slightly wetter than the indoor ones but in both instances good drainage is vital.

My latest method of cultivation is even more successful. I am growing the plants indoors in a small basement greenhouse under artificial light (2 four foot grow-lux / 2 cool white). I use the same methods described above, but in the basement temps rarely get over 65° F. The plants have pitchers over 18" and they are beautifully veined maroon. The hoods also are fuller and the "tongues" are large and well-developed with deep red venation.

This also brings up a point. Many people feel that the red coloration in carnivorous plants is due to intense sunlight. This is not always the case. I have found all my *Dionaea* to be brighter red in the traps under fluorescent light. All my *Darlingtonia* and several Pinguiculas are redder under the lights. This is perhaps due in part to the ultra-violet light from the grow-lux lamps, but it also seems the temperatures play a role here.

I have seen *Dionaea* grown by Bob Hanrahan at the World Insectovorous Plant facility at Arroyo Grande, California with a beautiful dark red color in the traps. These plants were grown in moderate shade in the multi-level growth area so they received little, if any direct sunlight. Arroyo Grande though, has very cool temperatures yearround. In August, when I visited WIP the temps were only in the sixties during the day. So it seems that in some way these two elements affect the plants to produce the color changes. And again, it points out how much more we need to study them in order to understand all the factors involved in successful growth.

(WIP has moved. See March, 1980 CPN source list.)

Photo by Kim Lynch

THE PREDACIOUS FUNGI

by Glen Claudi-Magnussen
(26861 Quevedo Ln., Mission Viejo, CA 92691)

A number of species of fungi have the ability to catch, kill, and consume certain animals. A variety of methods and mechanisms are used to capture prey, some of which are similar to those of the carnivorous angiosperms. Most of the predacious fungi are either Phycomycetes or Deuteromycetes. Most of the predacious Deuteromcetes are Hyphomycetes, many of which belong to the family Moniliaceae. About half of the genera of predacious Phycomycetes belong to the family Zoopagaceae. A few predacious funge are aquatic, but most can be found in soil, decaying plant matter, etc.

The most common method used by the predacious fungi to capture prey is with adhesion. The adhesive may be found covering the fungus, on special branches, on the inside of rings, or on spherical knobs. The knobs are found atop short, lateral branches. The rings are formed when hyphae bend and fuse with their own bases. In many species, complex networks are formed when secondary and tertiary rings arise from other loops. Some protozoans or other organisms are captured with adhesives, but nematodes are the principle prey, and in the case of adhesive rings, the only prey. The prey is captured on contact, and as it struggles, the fungus secretes additional adhesive to prevent its escape. Trophic hyphae then enter the prey to absorb nutrients. The adhesive found in the Phycomycetes is considerably stronger than that found in other fungi.

Probably the most fascinating trap used by predacious fungi is the constricting ring. The ring is composed of three cells, and is situated on a two cell stalk. The inner surface of the ring is sensitive to touch. When a nematode touches it, the cells swell to about three times their original volume, pinning the worm between them. Prior to swelling there is a lag of one to two seconds but the actual swelling takes only about one tenth of a second. Following capture, hyphae enter the prey and absorb the nutrients. The exact process causing the swelling is not known, but it has been hypothesized that the cell membrane becomes more elastic, allowing water to rush in and the cell to swell.

Rings are also used to capture nematodes in another way. These rings are slightly smaller in diameter than the nematodes captured. When a nematode tries to pass through the ring, it gets stuck. It then tries to force its way through the ring, but can only wedge itself tighter into the ring. Once the worm is caught, hyphae enter it to withdraw nutrients. This type of trap is usually called a "non-constricting ring."

Another method is used to catch rotifers. The tips of hyphal branches act as bait for the rotifers. When the rotifer bites the hyphae, it swells within the rotifer's mouth and secretes mucilage. Hyphae then grow through the mouth and absorb all but the shell. One species, *Monacrosporium passalopaga*, has developed another way to capture rotifers. When the rotifer bites its filament the fungus thrusts a lateral branch into the rotifer's mouth. This branch then swells, making it impossible for the rotifer to escape. The rotifer-catching fungi are usually found in association with algae where the rotifers are often found feeding.

There are also some species of fungi whose spores either adhere to or are ingested by their prey. The spores which adhere to the body surface then penetrate the surface. Both types grow within the prey's body, eventually killing the prey. Only the hyphae which produce spores grow externally; all other growth remains within the prey's body (with a few exceptions). At least one species (*Harposporium anguillulae*) has been shown to be highly attractive to a certain species of nematode, indicating that the chance of infection is not always purely random. While most other predacious fungi can survive without prey, these species cannot.

Not until 1888 was the carnivorous nature

(Please turn to p. 52)

A PHOTOGRAPHIC PRIMER OF VARIANTS OF *SARRACENIA FLAVA* L.

by *Donald E. Schnell*

Several readers have asked if CPN might be able to publish color photos of various CP species variants that have been discussed, particularly *Sarracenia flava and S. purpurea.* The co-editors of CPN feel that such comparison photos might indeed be useful.

We are starting off the series with *S. flava,* and will continue it—probably in the next volume year—with *S. purpurea.* In the meantime, we would appreciate your comments about this kind of presentation, and your suggestions for future topics.

The *S. flava* variants described briefly below and pictured on the following pages are those recognized by me after some study (see primary reference 1 below, and secondary reference 2 and 3). For various reasons I feel that these variants are genetic. Readers are invited to consult my papers for details of this concept which we cannot go into here in this short descriptive article. A few reprints are still available to those who have no access to the journal.

As a result of my study in the Carolinas, I recognized five clear coloration variants, with a possible sixth, the latter being very rare in the study area and therefore not subject to combined study of large numbers of plants. However, the variant (No. 6 below and in photos and on cover) is rather common in the Gulf coast range of the species and I believe it also is genetic and include it here.

The numbers below correspond to the numbered photos that follow.

1) The most common or typical form of *S. flava* throughout its range as a whole. Note the generally yellow-green pitcher color, minimal venation comparatively, and the purple pigment splotch on the interior of the lid column. Brunswick Co., NC.

2) The rather rare all red form with deep red pigment nearly to the ground. Note that the red color carries over to the interior of the pitcher. The pigment is of course most prominent when the plants grow in open situations, tends to fade to variable degrees late in the season, and will fade rather prominently if the plants are moved in spring or early summer, but will recur the following season if conditions are good. Brunswick Co., NC.

3) The form with a metallic reddish-brown or coppery pigment of the upper lid surface and tending to extend down the external surface of the pitcher tube about a quarter its length. Note the familiar purple splotch of the lid column, and somewhat more prominent venation. Brunswick Co., NC. (Also rear cover)

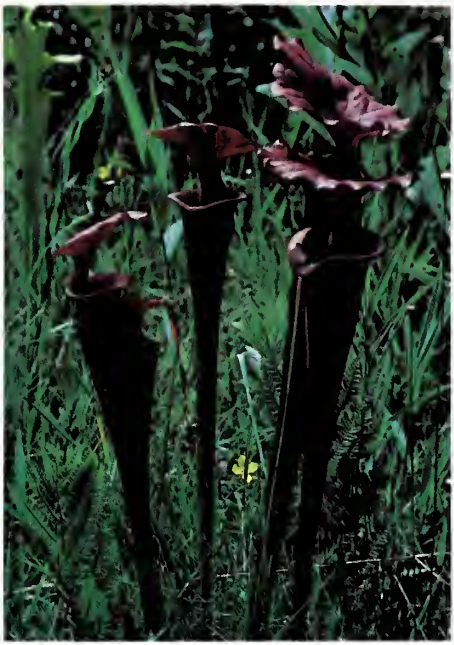
4) The striking heavily veined form has a very prominent, heavy pattern of reticulate red venation over the entire pitcher exterior as well as internal portions of the hood and column. Careful observation indicates that the purple splotch of the hood column is instead a confluence of veins in this form rather than a more diffuse or laked pattern as in (1). When moved or cultivated, this variant is susceptible to the same problems as outlined in (2) above. Brunswick Co., NC. (Also front cover)

5) The form which lacks all red pigment in the pitcher, being a diffuse pale yellow-green. However, pitcher primordia (pitcher buds) are often pigmented, so there is a reduction of pigment production in mature leaves, rather than the situation with *F. heterophylla* of *S. purpurea.* Brunswick Co., NC.

6) The probable sixth genetic color pattern variant. Note the green lid but with red veins, the variable vein confluence of the lid column, and the deep

Please turn to p. 44)

1) Typical form



2) All red form

VARIENTS OF

ALL PHOTOS BY

3) Upper lid with coppery pigment

4) Heavily veined form

5) Green form

6) Green lid with red veins

SARRACENIA FLAVA L.

DONALD SCHNELL

7) Hybrid

8) Probable hybrid between # 4 & 5

(Continued from p. 41)
red color of the external portion of the tube nearly to the ground. However, the interior of the pitcher is tan-green and not red (cf. 2 and 4 above). Liberty Co., FL.

7) and 8) Hybrid plants of the primary variants 1-5, photographed in the same bogs. Variant parentage may be difficult to determine. In 7, the condensation of what red pigment is there in the lid column suggests a hybrid between 1 and 5 as most likely, but there are other possibilities, including complex back and third crosses. Plant 8 is probably a cross between 4 and 5 above as suggested by the more diffuse pattern of light venation.

REFERENCES

1. Schnell, DE. 1978. *Sarracenia flava* L.: Infraspecific variation in eastern North Carolina. Castanea 43:1-20.

2._____1978. *Sarracenia* L. petal extract chromatography. Castanea 43:107-115.

3._____1978. Systematic flower studies of *Sarracenia* L. Castanea 43:211-220.

HOW TO RAISE FRUIT FLIES AS FOOD FOR CARNIVOROUS PLANTS

by R. Douglas Wiggins Jr.
(140 N.E. 72nd St., Portland, OR)

The semi-closed environment of a terrarium seldom contains enough insect life to provide a hearty diet for most carnivorous plants. I have found that the inclusion of wingless fruit flies provides my plants with enough nutrition that the growth rate is markedly increased. Pitcher plants, *Dionaea* and sundews each benefit from this treatment, although the smaller sundews and larger *Dionaea* sometimes have trouble keeping their prey.

Wingless fruit flies are *Drosophila melanogaster* that have been bred for the recessive gene that causes the wings not to form. Thus, the proper term is not wingless, but vestigial winged. The recessive aspect of this genetic trait means that, if a vestigial winged fly breeds with a wild type fly, all of the first generation offspring will have wings. For this reason, it is necessary to be careful that no wild type flies enter a wingless culture during transfers to other vessels.

It is actually fairly simple to raise fruit flies, as any lover of fruit must notice during the summer. A slice of ripe banana with a dash of yeast is a sufficient medium, but, as the banana decomposes, it becomes runny and often results in drowned fruit flies. A much better medium can be made of a mixture of corn syrup, corn meal, malt and a trace of fungicide to prevent mold formation. This medium can be further improved by the addition of more nutrients (note: the corn meal is to provide a solid substrate—mashed potato flakes could also be used).

The best and easiest to prepare medium is a dry commercial medium which is prepared by adding an equal volume of water and a few grains of active yeast. This medium can be obtained from biological supply houses in multiples of one liter volumes (one such place that does mail order business is Carolina Biological Supply Co., Burlington, N.C., 27215, or Gladstone, OR. 97027).

Fruit flies are very prolific and have a very short life cycle (that is, the period of time from the egg to the adult). The life cycle involves four stages. At 20 degrees centigrade (room temperature) the fly is in the egg and larval stages for eight days, and in the pupal stage for six days. The fly emerges an adult, and has a fairly long life expectancy. The female will begin laying eggs in a few days, and can lay 500 eggs in ten days

time. The females remain fertile all their lives.

To culture these flies, some medium is placed in a container (there are standard culture tubes available, 1¼" × 4") and a piece of coarse nylon net is added to allow the flies a place to stand (to keep them from getting stuck in the medium) and a porous plug is inserted (gauze or cotton will do, but there is an autoclavable foam plug made) that will fit the culture tubes and that will also neatly fit the neck of a 250 ml. erlenmeyer flask). After the medium sets for a minute, six or eight flies can be introduced by either shaking them into the container, or by inverting the empty container over the container of flies and allowing the flies crawl up into it (fruit flies are phototropic, so a light above the empty container will aid the transfer). In two weeks, more fruit flies will be emerging. If the cultures are kept at slightly higher temperatures, the life cycle will be shortened, but this increases the possibility of mold. Each culture can be kept for one month or longer, but keeping them too long might allow mite infestation. Two or more cultures should be kept, so that if one is lost by mite infestation one will be left as a spare. Never take a culture from a vial that does not appear to be producing multitudinous flies, as this is an indication of mites. In addition, the vials should be kept on "No Bugs M'Lady" shelf paper. This will kill any mites that walk across it, thus avoiding the spread of contamination. If this brand of Lindane treated paper is not available, any shelf paper can be sprayed with a solution of Lindane available at your local nursery. It is a contact pesticide, so it will not harm the flies in the vial.

If one has the desire to aid the growth of small sundews that normally could not hold a live fruit fly, the flies may be killed and fed to the leaf surfaces by hand (a time consuming but rewarding task that normally should be reserved for rare plants). Ether is the best killing agent. A glass jar with a one inch hole cut in the lid will hold the flies, while a cotton plug with ether on it is inserted in the hole. Death is indicated when the wings stand out from the body at about a 45 degree angle. Alcohol can be used instead of ether, but it is much slower (use denatured alcohol). Carbon dioxide gas or freezing temperatures will also work, but these require even more time. I have found that the use of winged flies for hand feeding is best, as the wings provide a purchase for tweezers. Although it may be possible to collect wild fruit flies by setting out a piece of ripe banana or some grapes (spontaneous generation?), wild flies collected in this fashion may have mite infestation and often do not do well in culture. I use cultures of white eyed fruit flies (as opposed to the wild red eye) in order that I may be certain that I do not receive the blame for the fruit flies around the fruit bowl.

Cultures are available from Carolina Biological Supply Co., Burlington, N.C., 27215, or Gladstone, OR. 97027). Phone number for Gladstone, OR. is 503-656-1641. Prices as of Jan. 9, 1980 are;

Drosophila cultures—$3.95@ or two and up for $3.75..... depends on trait
Culture Vials—$2.75 per doz..... 67-4060
Foam Vial Plugs—$1.25 per doz..... 67-4062
Drosophila Anesthetizer —$2.75@..... 67-4080
Medium—$3.50 per liter 67-5000
—$9.50 per 4 "..... 67-5002

★★★★★★★★★★★★★★★★★★★

SPECIAL NOTICE

For those CP enthusiasts who live in the San Francisco area, The Flower Show will take place at the end of August. To enter your plants in the show please write for a premium book and entry form after July 1. Write to:

Anthony Rea
738 22nd Ave.
San Francisco, CA 94121

This years' prizes total $150.00 and a *Cephalotus* class will replace the Unnamed Hybrids class.

A NEW DROSERA FROM THE TOP END OF AUSTRALIA

by Peter Tsang
528 Mt. Crosby Rd., Anstead
Brisbane, Qld., Australia 4070

Way up north where there is no snow and way up north where the big gums grow, comes this beautiful beautiful new sundew. It is always exciting to discover a new plant but it may not be necessary that the new found plant has the beauty or any interesting aspect, from the hobbiests' standpoint, to match the excitement of its discovery. Any scientific significance is another matter.

However, this sundew is unusual as well as beautiful and, above all, its new! Whether it has been come across by person or persons in the past, I do not know. But definitely new in the sense that it has never been listed or published before. The discoverer of this sundew is a good friend of mine of long standing and has been collecting various CPs and native tropical fishes for me from time to time as we do a lot of exchanges nationally and internationally. It was during one of these collecting trips that my friend stumbled upon this new sundew. I have given live materials to our Government botanist and CPN member Dr. Laverack to study. Unfortunately, no classification can be made until they flower again next summer as at the time of discovery, the flowering period was just over. If possible, I would like this sundew be named *DROSERA FALCONERI* in honor of its discoverer. (Fig. 1)

My friend, Mr. Falconer described that this sundew is found in a very restricted area and the colony is extremely small. No photogaph could be taken to show of its natural habitat due to very tall grass densely covering the area. A pecularity was noted in this particular area in that the pH of the soil reads around 8 instead of the normal common characteristic in Northern Territory where soil is in general with low (acid) pH.

Upon close examination of this sundew, I am inclined to believe that it must belong to the same group as *D. petiolaris* (Fig. 2) because of their great similarity in their root

(Please turn to p. 48)

Fig. 1. New species of *Drosera*
Photo by Peter Tsang

Fig. 2. *D. Petiolaris*
Photo by Peter Tsang

Nepenthes ampullaria Dietrich Varez, Jr., 1980

Dietrich Varez, Jr. (Box 13, Volcano, Hawaii 96785).

I am 13 years old and made this block print by carving a linoleum block. The block is inked and pressed on paper. I chose the *N. ampullaria* for my subject because I like the short, wide pitchers of this species. I plan to make prints of other plants and send them to CPN when they are finished.

THE NEW FOREST BOGLANDS

by David W. Taylor
(The Everglades, 76 Crosslands Ave., Norwood Green, Southdall,
Middlesex UB 2 5RA, Great Britain)

The many levels of land and the different areas of changing vegetation that make up the vast expanse of the New Forest include the forest boglands. These wild and desolate places, some of which are almost impassable, are scattered all over this mighty region of land that lies in the south west corner of the county of Hampshire in southern England. They are extremely rich in flora both common and rare, and are the home of countless birds and insect life. A number of rivers flow into these lands thereby keeping them constantly wet. Two of the forest boglands that I have visited on a number of occasions are Bishops Dyke which is a sphagnum bog, and Hinchelsea bog. This is largely a peat bog, and it is here that all three of our native Droseras are to be found. It is a very wet area of land, and in one particular part where the water level is eighteen inches deep, there is to be found *Drosera anglica* (Fig 1). As this land is so wet there is but a single footpath leading straight through the centre, and the only people that use it, are day-trippers and hikers. Compared with this bog, Bishops Dyke is more walkable. The first sign that you are near to this bog, is the many stands of cotton-grass that can be seen quite clearly some three hundred yards away. (Fig. 2) It is at this bog that *Drosera intermedia* and *rotundifolia* can be found. Also here is *Utricularia minor*.

Both these bogs and the many others in the New Forest are areas of land that have hardly altered over hundreds of years. The casual walker feels a sense of freedom as he or she walks in loneliness through these lands of floral and natural interest.

Fig. 1.
D. anglica
In Hinchels Bog

Photo by
David Taylor

. . . New *Drosera* — P. Tsang

structure and their tomentose crown when dormant. Yes, even in the far north of Australia where there is no winter and plants still go dormant because of the extreme high contrast of wet and dry seasons. *D. petiolaris* has long and slender petioles which when young, tends to be pubescent where as the new sundew has short, broad and glaborous petioles. The glands on the leaves of this new *Drosera* are extremely fine almost like those of the pygmy species.

After the initial shock, my plants are starting to put on new leaves but it is still too early to tell how well they will fare, long term wise, in Brisbane. A very limited plants will be available for exchange only.

Fig. 2.
Cotton Grass in bog at
Bishops Dyke

Photo by
David Taylor

Continued from p. 78 — Recent Literature Review

Matile, L. *Xenoplatyura beaveri,* new species, (Diptera, Mycetophiloidea) of Keroplatidae living in *Nepenthes* pitcher plants in Malaysia. Ann. Soc. Entomol Fr. 15 (1): 31-36. 1979.

A two-winged fungus gnat was bred from larvae spinning webs in the urns of the pitcher plant *Nepenthes ampullaria* on the island of Penang.

Nesbitt, H.H.J. A new anoetid, *Creutzeria seychellensis,* a new species from the Seychelles. Can. Entomol. 111 (11): 1201-1206, 1979.

Nepenthes pervillei pitchers support the above genus of tick.

Schnell, Donald E. 1980. *Pinguicula caerulea* Walt. forma *leucantha:* A new form. Castanea 45:56-60.

A white flowered variant of *Pinguicula caerulea* Walt. is herein described and pictured, its significance being possible confusion in field identification with commonly white flowered plants of *P. pumila* Michx. (Reprints: D.E. Schnell, Rt. 4, Box 275B, Statesville, NC 28677, USA)

Taylor, Sylvia. 1979. Insectivorous plants in British Columbia. *Davidsonia* 10:41-53.

An excellent summary article on the CP found in British Columbia. Brief but accurate descriptions of the plants are given, often with a sketch, and habitats are discussed. There is a general introduction discussing carnivory. Note: Reprints of this article are *NOT* available, but copies of the entire journal can be purchased for the reasonable cost of $1.50 plus postage (your choice) from the Office of the Botanical Garden, 6501 Northwest Marine Dr., Vancouver, BC, V6T 1W5, Canada; ask for *Davidsonia,* Vol. 10, No. 3.

Shinonanga, S., Beaver, R. *Pierretia urceola,* a new species of sarcophagid fly found living in *Nepenthes* pitcher plants in West Malaysia. Ann. Soc. Entomol. Fr. 15 (1): 37-40. 1979.

The authors described a new species of sarcophagid fly found living in *Nepenthes* pitchers in Malaysia.

Skogen, A. 1979. *Drosera intermedia* in Norway. Blyttia 37: 15-20. IN NORWEGIAN (English summary).

This interesting distributional and ecologic review indicates that many herbarium sheets for the country are mislabeled due to confusion of *D. intermedia* with *D.* x *obovata (D. anglica* x *rotundifolia*). Correction of these and additional locations indicate a southern coastal range with the

(Please turn to p. 53)

Beginner's Corner

CEPHALOTUS FOLLICULARIS

by *Donald Schnell*

First described by Labillardiere in 1806, the Australian pitcher plant is confined to a relatively small range in extreme southwestern Australia where it grows in rather dense, reedy peat swamps, often heavily shaded. In some of the swamps nearer the ocean, the water becomes brackish, as does the peat soil, and some have concluded that a "pinch of salt" (NaCl) in *Cephalotus* growing medium will do wonders. However, it is not clear whether the plant's growth in more brackish areas amounts to a tolerance rather than a requirement, and many areas are not brackish at all.

Only 15-20 years ago *Cephalotus* areas were still rather inaccessible except for a few marginal locations within a few hours walk from primitive roads. In the late 1950's, a very understanding government forester based in Perth provided me with living material on two occasions, perhaps the first location collected material for propagation sent to this country. His letters always contained several sentences about the difficulties the field man encountered in aquiring the material, all of which made the plants I was fortunate to receive seem that more precious and exotic. Now, current correspondents indicate that *Cephalotus* stands are indeed quite accessible, and that development has proceded apace in the area with many former locations now being drained fields for agriculture. Plants are plowed up by the thousands as roads are cut. Still, I understand that protected areas remain, the government is more benevolent than before, and the species apparently has reached the same state of uneasy equilibrium that *Dionaea* has in this country.

In spite of superficial resemblances, *Cephalotus* is not held to be closely related to *Nepenthes,* and certainly not to the Sarraceniaceae. Its evolutionary development of pitchers for carnivory appears to be an example of convergence or parallelism.

The plants sprout from an underground, mainly horizontal rhizome from which fibrous roots penetrate into the peat. The rhizome is rather soft (compared to *Sarracenia*), brittle, and attains a diameter averaging 1.0 cm. The growth points give rise to two main kinds of leaves approximately sequentially: an ovate to lanceolate slightly succulent vegetative leaf which is completely unspectacular; and the well-known pitcher which on the average reaches 4-5 cm in length in the field. In cultivation, these are more likely to be 2-3 cm. There is apparently at least one genetic variant with pitchers that regularly reach 6-8 cm. I received living material of this form about three years ago and the pitchers are indeed consistently larger, even in cultivation. The plain vegetative leaves are also larger. A third kind of leaf often appears between the two just described, an intermediate leaf which is largely flat but has some indication of cupping to varying degrees at the tip. In cultivation in the northern hemisphere, the vegetative leaves appear in late summer to early fall, followed by a few intermediates, and then pitcher leaves in late fall into winter. Flowering is in late winter to early spring.

The flowers appear as a spike, the peduncle being up to 60 cm long in the field but considerably shorter in cultivation. The flowers are apetalous with greenish-tan sepals and 12 stamens.

Culture—

Pot—Plastic with drainholes, not set in water.

Medium—Live sphagnum or Canadian peat. The former often overgrows the plant, so peat is preferred.

Planting—Place the rhizome horizontally about 1-1.5 cm below the soil surface. Horizontal placement encourages many growth points along the rhizome, vertical placement (or acute angle) encourages fewer but larger growths.

Watering—Pure. Keep constantly damp but not sloppy.

Humidity—Very high.

Light—Diffuse sunlight (barely shadowed) bright shade. Full sun not recommended in cultivation. Good fluorescent light subject in a terrarium.

Fertilizer—*Lightly* spray foliage monthly with ¼ strength balanced fertilizer liquid.

Temperatures—Grows best at medium to slightly warm (16-27°C), does not do as well in culture in overly warm situations. Can withstand cold down to just above freezing.

Propagation—

Sexual—Seed propagation has little to recommend it. As the flowers on the spike appear to mature, they often abort in culture and no viable pollen is produced and stigmata may not be receptive. Occasionally one may recover dry, viable pollen and this should be transferred to stigmata of flowers that appear open up and down the spike (in any one flower, stigma receptivity is asynchronous with pollen production) as well as to flowers of different plants, preferably different strains. Mature seed can often be recovered in 6-8 weeks. Most growers have had little to no luck with germination, and perhaps some degree of stratification, water soaking or hormone treatment might prove helpful on an experimental basis.

Vegetative—This is the preferred technique for propagation of *Cephalotus* and can be achieved by two means:

1. Leaf—One can often induce budding in *non-pitcher* leaves. Newly emerged leaves should be used (juvenility is a factor in success) and these should be peeled off the shoot so that there is a maximum of

Cephalotus follicularis Drawing by Jim Miller

shoot so that there is a maximum of petiolar base tissue. Place the leaf upright about half way down into damp living sphagnum and keep in conditions similar to mature plants. It is important not to over-water and to keep the cuttings on the warm side of limits. New buddings will often appear from the base of the leaf petiole down in the sphagnum. These new shoots should not be disturbed until they appear like miniatures of their mature counterparts. During this budding, rooting and initial growth phase, keep the growing living sphagnum carefully pushed down so that it does not cover the cuttings.

2. Rhizome—This is the most rapid and successfull method of all. One can simply cut rhizomes into 1.5 cm lengths and plant these horizontally as for plants, and new shoots will appear. Or one can simply plant an entire rhizome horizontally, allow new shoots to appear, be certain of root development, and then divide the rhizome halfway between adjacent shoots. Each of these sections of rooted rhizome with new shoots can then be potted up as separate plants. Obviously, this process will usually occur naturally in any healthy planting, and one can make offset pottings at any time.

Final Comment—

Cephalotus is certainly one of the most "growable" carnivorous plants and is now commercially available from propagated material. There does not appear to be a dormancy requirement and propagation is very simple by the rhizome method. The most likely pitfalls will be overwatering (especially in cooler situations), lack of proper drainage, overheating, and improper lighting.

When you first obtain your plant, your first step should be to establish it with sound horticultural techniques as described above. After the plant is fluorishing, then try propagation, first dividing the rhizome between shoots which will likely have appeared. Next, try the vegetative leaf technique which is somewhat more chancey but can work well. Do not peel off all the flat leaves from your main plant, and do not damage the central stalk of the growth shoot.

Many enthusiastic new growers try to rush into propagation too early—a cardinal rule of horticulture is to look after your stock plant first. Once your stock plant is robust, then try propping, using the most certain method first, and one method at a time sequentially until you have a reserve of many offset plants. At this point, you can then safely experiment with new or unchecked techniques, or ideas you might have. If they work, let us know about it!

(Continued from p. 40)

of some fungi was discovered. Now, over 100 species in about two dozen genera are known. There is still confusion, however, about these fungi and their classification, and much work will have to be done before they are as well understood as the carnivorous Angiosperms.

BIBLIOGRAPHY

Drechsler, Charles, "Organs of Capture in Some Fungi Preying on Nematodes," *Mycologia,* XXVI (1934), 135-144.

_____, "Some Hyphomycetes That Prey on Free-Living Terricolous Nematodes," *Mycologia,* XXIX (1937), 447-552.

Duddington , C.L., "Fungi That Attack Microscopic Animals," *The Botanical Review,* XXI (July 1955), 337-439.

Duddington, C.L., and Wyborn, C.H.E., "Recent Research on the Nematophagous Hyphomycetes," *The Botanical Review,* XXXVIII (October 1972), 545-565.

Lloyd, Francis Ernest, *The Carnivorous Plants,* New York, Dover Publications, Inc., 1976.

Sparrow, F.K., Jr., "A Note on the Occurrence of Two Rotifer-Capturing Phycomycetes," *Mycologia*, XXI (1929), 90-96.

Continued from p. 49 — Recent Literature

limiting factors being sufficient moisture (in either rich or impoverished soils), sufficiently long growing season (southern distribution in Norway), and low competition. The species rarely occurs inland and north, and in addition to lack of suitable wet, low competition habitat in a sufficient growing season, poor dispersal (probably by birds) is felt to play a part. DES (article sent by DC Speirs)

Winston, R.D. and Gorham, P.R., 1979. Roles of endogenous and exogenous growth regulators in dormancy in *Utricularia vulgaris*. Can. J. Bot. 57:2750-2759.

A companion paper to the above by the same authors in which plant growth regulators (plant hormones) effects on dormancy are investigated. Regulators studied were the classes auxins, abscisic acid, gibberellins and cytokinins. During turion induction, abscisic acid levels rose and gibberellins were bound, abscissic acid applied to actively grown plants could induce dormancy. Kinetin induced sprouting in innate dormancy but further growth could not be sustained, unless supported (best response in last stage of dormancy) by auxin and / or gibberellin applications. Levels of these compounds measured in the turions during three states of dormancy and variations of light and temperature as discussed in the preceding paper paralleled the experimental results. An excellent flowchart summary of the work is provided.

Winston, R.D. and Gorham, P.R., 1979. Turions and dormancy states in *Utricularia vulgaris*. Can. J. Bot. 57:2740-2749.

Turion studies were made over a year in the field, and from specimens collected throughout dormancy and treated to varying degrees of temperature and photoperiod in the lab. Dormancy was found to be in three states: pre-, innate and imposed. Turions began forming soon after summer solstice and short days seemed to be the inducing factor. In late fall and early winter, innate dormancy could be temporarily broken by high temperatures (30°C) but cooling to 20°C resulted in prompt turion reformation in spite of photoperiod manipulation. Only during the last stage (imposed or environmentally controlled) of dormancy would high temperature sprouting and long day treatments result in robust growth. An excellent study worth reading in its entirety for details of the exploration of this subject.

Wirth, W.W. and Beaver, R.A. The *Dasyhelea* biting midges living in the pitchers of *Nepenthes* in southeast Asia. Ann. Soc. Entomol. Fr. 15 (1): 41-52, 1979.

Five species of the genus *Dasyhelea* midges are found in *Nepenthes* pitchers and are known to breed there.

SPECIAL NOTICE

CPN wishes to apologize for the delay in mailing of the March, 1980 issue. Various problems in the production were responsible. We sincerely hope that this problem will not be repeated.

N. rafflesiana Photo by Steve Smith

— CPN BOOK SHOP —

The books listed below are Japanese books written in their language on the subject of CP. They are generously interspersed with many excellent pictures in color and B&W. The prices include all postage and insurance costs (both overseas and domestic). Please send your check or money order to J.A. Mazrimas before August 1, 1980. At that time the books will be ordered and you should expect a delay of two or three months before you receive the books. All books are sent by surface mail. Starred books are newly published.

AUTHOR	TITLE	PAGES	PRICE
———————	*Aldrovanda vesiculosa* at Hanyu-City	32	$6.50
Asashi	Plants of the World:		
	#9 *(Utricularia)*		*$2.50*
	#64 *(Drosera, Nepenthes, Sarracenia)*		$2.50
	#46 *(Cephalotus)*		$2.50
Komiya, S.	Carnivorous Plts., Observation & Cultivation	160	$4.50
———————	Garden Life Magazine Vol. 7,1977		$5.00
Komija, S. & Shimizu, K.	Examination Notes on Carn. Plts.	90	$4.50
Kondo	Carnivorous Plants	292	$10.00
Shimizu	The Mystery of Carn. Plts.	54	$5.00
Suzuki	Insectivorous Plts. (Cult. & Coll.)	168	$3.25
Yamakawa, G.	Insectivorous Plants	152	$3.75
* Kusakabe, I.	(CP portion): Cacti, Succulents and Insect Plts.	127	$9.00
* I. P. S. J.	Insectivorous Plants	199	$10.00

Prices are U.S. Dollars.

SPECIAL NOTICE

Our stocks of Volumes I-IV have been temporarily exhausted. For those who have already sent their money in, your refund will be forwarded shortly. We will notify our membership as soon as they become available.

Please note our new address. All inquiries about your subscription, as well as payments, should be sent to: CPN, c/o the Fullerton Arboretum, California State University, Fullerton, Fullerton, CA 92634, USA.

COMING IN SEPTEMBER

—The British CP Society

—CP Growing The Unique Way – A Report From Down Under

WANT ADS

Richard Chinnock, 3316 Old Kirkwood Dr., Virginia Beach , VA 23452. (WB) Sarracenia purpurea ssp. purpurea f. heterophylla, S purpurea venosa (pink flower), S. purpurea ripicola, Drosera miniata, D. nitidula, D. scorpoides, D. androsacea, D. "Lake Badgebup", D. "Bannister", Cephalotus follicularis.

William Clemens, 7410 Lime St., Apt. E, La Mesa, CA 92041. (WTSB) Byblis gigantea, Drosera regia, D. Petiolaris, D. schizandra, D. trinervia, D. burmanii v. dietrichiana, D. glanduligera, D. montana v. robusta, D. whittakeri, Pinguicula caudata, P. grandiflora, P. gypsicola, P. ionantha.

John Graham, 8 Waruda St., Bracken Ridge, Queensland, 4017, Australia. Wishes to trade seed of Drosera burmanii var. dietrichianea for seed of the following: D. cistiflora, D. cunefolia, D. regia, D. natalensis, other rare South African Drosera, P. gypsicola and other tropical Pinguiculas, U. simulars, U. sandersoni and any Heliamplora.

ERRATA – Rear cover is *S. flava* variant #3. See pp. 41 & 42.

Jeff Gold, 13126 Anza Drive, Saratoga, CA 95070. (TS) in limited quantities: Dionaea muscipula (large plants), Drosera aliciae (seedlings), D. auriculata (seedlings), D binata (various forms, plants and cuttings), D. dielsiana (seedlings), D. hamiltoni (small plants), D. intermedia (small plants), D. montana (seedlings), D. neoccalednica (root cuttings), D. peltata (mature plants), D. X nagamoto (mature plants), Darlingtonia californica (offshoots), Sarracenia purpurea (small plants), S. minor (seedlings), S. psittacina (small divisions), various Utricularia starters, miscellaneous other CP, and other exotic plants. (WBT) Australian CP (seeds, plants or cuttings of the above).

CPN SEED BANK

5 / 14 / 80 $.50 / Packet

Byblis liniflora, Darlingtonia californica, Dionaea muscipula, Drosera binata (8), *D. burmannii* (15), *D. capensis, D. capensis* (narrow), *D. capillaris, D. capillaris* (long lf.), *D. capillaris* (white fl.) (5), *D. capillaris* mix, *D. erythrorhiza, D. filiformis filiformis, D. heterophylla, D. intermedia, D. macrantha, D. natalensis, D. peltata, D. planchonii, D. pygmaea* (1), D. rotundifolia, D. rotundifolia (Oregon), D. *spathulata, D. spath.* (Kansai), *D. spath.* (Kanto), *D. spath.* (white fl.) (3), *Drosera* mix (U.S. rosettes) (11), *Nepenthes gracilis* (5), *N. rajah* (4), *Pinguicula alpina* (6) *P. caerulea* (1), *P. grandiflora* (10), *P. grandiflora* ssp.*rosea* (10), *P. vulgaris, P. vulgaris* f. *bicolor* (10), *Sarracenia flava, S. flava* (Gulf), *S. leucophyla, S. minor, S. purpurea purpurea* (9), *S. purpurea venosa, S. rubra jonesii, S. flava* x *oreo.* (15), *S. leuco.* x *flava* (mixed w / leuco.), *Sarracenia* mix (3).

Pat says that the Seed Bank in getting low. Please send in your extra CP seed as soon as possible. See March, 1980 CPN for instructions.

Sarracenia flava L. variant with red-veined green lid, and deep red tube exterior. Liberty Co., Fl.
Photo by Donald E. Schnell

LIBRARY
JUN 1 1980
NEW YORK
BOTANICAL GARDEN